**Unit Design Template**

**Unit Title: Simple Machines**

**Course/Subject Area: Science**

**Grade Level: 4th Grade**

**Approximate Length of Unit:**

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**Unit Overview or Description:** Students will understand that machines are tools that make work easier and force is needed to get work done. Simple machines are used to get word done. Simple machines are divided into six categories: inclined plane, wedge, wheel & axle, pulley, screw, and lever

**STAGE 1: Identifying Desired Results**

**Conceptual Focus:**

Simple Machines

Forces

Scientific Process

**Enduring Understandings:**

Students will understand that . . . .

* Without a force like a push or pull, an object won’t budge. Once an object is moving it won’t stop moving in a straight line unless it’s forced to change its movement by another push or pull.
* The greater the force of an object, the greater the change in motion.
* For every action, there is an equal and opposite reaction.
* Machines are tools that make work easier by reducing the force needed to do work.

**Essential Questions:**

**Describe how force relates to work?**

**How do machines make work easier?**

**How does force affect motion?**

**Topic: Forces**

**Learning Targets:**

Students will be able to . . . . .

* Explain how the force needed to move an object can be altered by variables (the amount of friction, gravity, or weight).

**BEFORE UNIT:** Give pre-test survey using survey monkey, see example survey on:

**Day 1**:

* Word Splash-activate prior knowledge of simple machine/force vocabulary.
* Investigate forces, what influences force, (weight, friction). What is force?
* **(problem 1)** Will the block require less force to be moved across carpet or smooth desk? (Problem 2) Will the weighted block more or less force to move across the smooth desk?
* Record **hypotheses** on board
* Test results **(experiment)**
* Discuss **observations** as a class
* What are our **conclusions**? How does force affect motion? How does the amount of friction and weight affect the amount of force?
* Transition into simple machines (like wedges, levers, wheel and axle) make life easier (require less force).

**Topic: Simple Machines**

**Learning Targets:**

Students will be able to . . . . .

* Identify machines in our world and everyday life.
* Identify and describe the 6 different simple machines

**Day 2**:

* See Powerpoint to introduce 6 simple machines
* Show school tube video to see examples of simple machines in use (http://[www.schooltube.com/video/36894/Simple-Machine-Scavenger-Hunt](http://www.schooltube.com/video/36894/Simple-Machine-Scavenger-Hunt) )

**Day 3**:

* In computer lab, kids are working on websites:
  + <http://www.cosi.org/files/Flash/simpMach/sm2.html>
  + <http://edheads.org/activities/simple-machines/frame_loader.htm>
  + <http://www.harcourtschool.com/activity/machines/simple_machines.htm>
  + <http://www.lessonplanspage.com/ScienceMusicSongForTeachingSimpleMachinesIdea3.htm>
* At school scavenger hunt, kids move in groups to take pictures of simple machines around school.

**Day 4**:

* Download pictures into a file on the group drive. Kids will insert pictures into Movie Maker or PowerPoint and label pictures with the correct simple machine.
* At home scavenger hunt using survey (<http://www.surveymonkey.com/s/8Z3X8BM>)

**Day 5:**

* Graph the results from the survey using excel
* Analyze results
* Introduce catapult lab and construct catapult using plastic bottle, spoon, rubber band, plastic straw, popsicle stick.

**Day 6 & 7:**

* Investigation on levers (catapult):
* **Problem:** Will the marshmallow or tootsie roll launch farther? Will the marshmallow/tootsie roll launch farther with little or great force?
* **Hypothesis:** Students choose a test (test a: marshmallow/little force, test b: marshmallow/great force, test c: tootsie roll/little force, test d: tootsie roll/great force) will have the farthest distance.
* **Experiment:** Students will test their catapults using the variables of mass and force.
* **Observations:** Students will record results and find the average distance for each of the 4 tests using the catapult (see attached sheet for recording results).
* **Conclusions:** Students will graph their own results on an excel spreadsheet (using the template, sample and blank template attached) (\* This can be done during scheduled computer lab time). Discuss variables (reasons for results)

**Topic: Simple Machines**

**Learning Targets:**

Students will be able to . . . . .

* Describe how energy is transferred from one source to another to help accomplish work.

**Day 8:**

* Graph the results from the catapult lab using Excel
* Analyze and draw conclusions based on results
* Type conclusions in Word document

**STAGE 2: Determine Acceptable Evidence**

What evidence will show that students understand?

* Describe the Performance Task(s) students will complete.
* This performance assessment will be broken down during the duration of the unit to make it more manageable for the students.
  + Pre/Post-Surveys
  + Scavenger Hunt-at school and home
  + Analyzing catapult lab data
* Attach copy of Performance Task and Rubric if those are completed.

Other Evidence (quizzes, tests, observations, conversations, work samples)

* List other evidence of student learning that will be collected.
  + **Survey -** Online scavenger hunt for a variety of simple machines and the force that is used to complete the work. (http://[www.surveymonkey.com/s/8Z3X8BM](http://www.surveymonkey.com/s/8Z3X8BM)­)
    - Survey Monkey for pre/post test
  + **Informal Observations and Anecdotal Notes**- Notes from observations during labs and class discussions on simple machines and forces.
  + **Work Samples-** bar graphs for analyzing data from survey and catapult lab
  + **STAGE 3: Plan Learning Experiences and Instruction**

Consider the WHERETO elements:

|  |  |  |
| --- | --- | --- |
|  | **Questions for the Designer** | **Designer’s Responses/Notes** |
| **W** | How will you help students know **where** they are headed, **why**, and **what’s** expected of them? | * Post Essential Questions throughout unit * Pre-survey and word splash gives students insight into the unit * Show School tube video prior to scavenger hunt |
| **H** | How will you **hook** students at the beginning of the unit? How will you **hold** their interest throughout the unit? | * Word Splash * School Tube Video * Interactive Websites * The use of PHEOC * Online surveys |
| **E** | What events, real or simulated, and learning activities can students **experience** that will help them **explore** the big ideas and essential questions of this unit? What instruction is needed to **equip** students for the final performance? | * PHEOC labs * Scavenger hunts |
| **R** | How will you cause students to **reflect** and **rethink** to dig deeper into the big ideas?  What opportunities will they have to **revise** their work based on feedback? | * Students will be analyzing data from surveys and catapult lab * Strategy groups will be developed to support learners throughout the unit |
| **E** | What opportunities will students have to **evaluate** their own progress and self-assess? | * At home survey will be taken to find simple machines * Students share scavenger hunt slideshows in partners |
| **T** | How will you **tailor** the learning and instruction to accommodate the learning needs of students? | * Strategy groups * Partners if necessary * Conference with students throughout |
| **O** | How will you **organize** the unit for optimal effectiveness? (learning-doing-reflecting, whole-part-whole) | * By building background knowledge on forces and simple machines, students will gain understanding for the unit. |